REMARKS/ARGUMENTS

Reconsideration of this application is requested. Claims 1-62 remain in the application, with claims 4-7, 19-21, 23-26, 31-42, and 45-62 having been withdrawn from consideration.

Claims 1-3, 8, 9 and 22 have been rejected under 35 U.S.C. 102(e) as being anticipated by Binnig et al. (US 7054257).

In regard to claim 1, Binnig et al. was cited as teaching a cantilever (citing fig. 2, element 11) disposed with a medium which is movable relative to the cantilever (citing fig. 2, element 16); a device associated with the cantilever and which is configured to be responsive to changes in electrical field between the medium and the cantilever caused by a change in distance between the medium and the cantilever (citing column 7, lines 10-30, and fig. 3 element 25, and column 18, lines 59-67, and column 19 line 1 and fig. 9); a heater disposed on the cantilever for selectively heating the medium and for inducing localized topographical changes which represent bits of data (citing column 6, lines 65-67, and column 7, lines 1-2, and fig. 4b element 36); and a circuit which electrically interconnects both of the device and the heater (citing fig. 4b).

This rejection is traversed. The Applicants respectfully submit that the invention defined in claim 1 includes features and combinations of features that are not shown or suggested by Binnig et al. In particular, claim 1 includes a device associated with the cantilever, which is configured to be *responsive to changes in electrical field between the medium and the cantilever caused by a change in distance between the medium and the cantilever.*

The Office Action cites column 7, lines 10-30 and fig. 3 element 25; and column 18, lines 59-67 and column 19, line 1 and fig. 9, as showing this feature. However, the Applicants respectfully submit that contrary to the assertions of the Office Action, Binnig et al. does not show or suggest the use of a device that is *responsive to changes in electrical field between the medium and the cantilever.* The Office Action clearly misinterprets the teachings on Binnig et al.

Binnig et al. shows a probe of the type discussed in the background section of the present application in paragraphs [0003] – [0008]. That is, Binnig et al.

uses thermal sensing that responds to changes in the thermal conductance between a heating element and a storage medium. The "field" discussed in column 7 lines 10-30 of Binnig et al. is an area of the storage medium, not an electric field. Column 7 lines 10-30 of Binnig et al. describe a read process in which changes in the temperature of a heater result from changes in heat transport across a gap between the heater and the storage medium.

With regard to the Applicants' previous arguments, the Office Action states:

> "The examiner maintains this rejection because Binnig et al. discloses in column 18 lines 61-63 and fig. 9 elements 90 and 91, electrodes that measure the variable capacitance as the thickness of the gap varies. As the capacitance changes the electric field inherently changes."

However, the Applicants' respectfully submit that the electrodes 90 and 91 of Fig. 9 of Binnig et al. are positioned on the lever and the support structure. Thus any change in electric field resulting from capacitance changes in the structure of Binnig et al. is *between the lever and the support structure*, and not *between the medium and the cantilever*, as recited in the Applicants' claim 1.

The apparatus of the Applicants' claim 1 uses a fundamentally different read process than the apparatus of Binnig et al. Binnig et al. uses a change in temperature of a heater, which is affected by changes in heat transfer between the heater and the storage medium. The Applicants' claim 1 uses a device that is *responsive to changes in electrical field between the medium and the cantilever.*

The capacitance shown in fig. 9 and discussed in column 18, lines 59-67 and column 19, line 1 of Binnig et al. is between electrodes on the lever, and electrodes on a support structure (i.e., item 81 in FIG. 8). The capacitive sensors of Binnig et al. detect a change in a gap between a lever and a support structure. Binnig et al. does not disclose or suggest any means for establishing *an electrical field between the medium and the cantilever*. Thus Binnig et al. does not disclose or suggest any device configured to be responsive to *changes in an electrical field between the medium and the cantilever.*

The Applicants' claim 1 specifies that the device is configured to be responsive *to changes in electrical field between the medium and the cantilever caused by a change in distance between the medium and the cantilever.*

In regard to claim 2, Binnig et al. was cited as teaching that the circuit forms at least a part of one of the device (citing fig. 4b).

Since claim 2 depends from claim 1, this rejection is traversed for the reasons set forth above with respect to the traversal of the rejection of claim 1.

In regard to claim 3, the Office Action states that there must be circuit portions connecting the read element 25 of Binnig et al. and the heater.

Since claim 3 depends from claim 1, this rejection is traversed for the reasons set forth above with respect to the traversal of the rejection of claim 1.

In regard to claim 8, Binnig et al. was cited as teaching that the cantilever comprises a probe which extends from the cantilever and which is configured to be contactable with a surface of the medium and to respond to a topography of the medium to cause the distance between the cantilever and the medium to vary (citing fig. 2, element 13).

Since claim 8 depends from claim 1, this rejection is traversed for the reasons set forth above with respect to the traversal of the rejection of claim 1.

In regard to claim 9, Binnig et al. was cited as teaching that the medium is electrically non-conductive and is supported on an electrically conductive substrate (citing column 6 lines 62-64).

Since claim 9 depends from claim 1, this rejection is traversed for the reasons set forth above with respect to the traversal of the rejection of claim 1.

In regard to claim 22, the Office Action refers to the rejections of claims 1 and 9.

This rejection is traversed for the reasons set forth above with respect to the traversal of the rejection of claim 1. The Applicants respectfully submit that the invention defined in claim 22 includes features and combinations of features that are not shown or suggested by Binnig et al. In particular, claim 22 includes a device formed in the cantilever which responds *to a change in electric field induced by a change in*

distance between the cantilever and a substrate on which the medium is supported. As stated above, Binnig et al. shows a probe of the type discussed in the background section of the present application in paragraphs [0003] – [0008]. That is, Binnig et al. uses thermal sensing that responds to changes in the thermal conductance between a heating element and a storage medium. The "field" discussed in column 7, lines 10-30, of Binnig et al. is an area of the storage medium, not an electric field. Column 7, lines 10-30, of Binnig et al. describe a read process in which changes in the temperature of a heater result from changes in heat transport across a gap between the heater and the storage medium.

Furthermore, the capacitance shown in fig. 9 and discussed in column 18, lines 59-67 and column 19, line 1 of Binnig et al. is between electrodes on the lever and electrodes on a support structure (i.e., item 81 in FIG. 8). The Applicants' claim 1 specifies that the device is configured to be responsive *to a change in electric field induced by a change in distance between the cantilever and a substrate on which the medium is supported.* Binnig et al. does not disclose or suggest any means for establishing *an electrical field between the substrate and the cantilever.* Thus Binnig et al. does not disclose or suggest any device configured to be responsive to *changes in an electrical field between the substrate and the cantilever.*

Claims 10-13, 15-18, 27-30 and 43-44 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Binnig et al. in view of Azuma et al. (US 6477132).

In regard to claims 10 and 27, Binnig et al. was cited as teaching all the elements of claim 10 except wherein the device is a FET (Field Effect Transistor). Azuma et al. was cited as teaching that the device is a FET (Field Effect Transistor) (citing column 18, lines 29-37).

According to the Office Action, it would have been obvious to one of ordinary skill in the art to provide the apparatus of Binnig et al. with the FET's of Azuma et al.

Since claims 10 and 27 depend from claims 1 and 22 respectively, this rejection is traversed for the reasons set forth above with respect to the traversal of the rejections of claims 1 and 22, and for the following reasons. Claims 10 and 27 recited

that the *device* is an FET. The *device* in claims 1 and 22 is responsive *to a change in electric field induced by a change in distance between the cantilever and a substrate on which the medium is supported.*

The FETs described at column 18, lines 29-37 of Azuma et al. are used as switching devices 47 in fig. 15 to control the application of a recording voltage. The Applicants respectfully submit that it would not be obvious to substitute the FET switches of Azuma et al. for the sensing device (i.e., the heater) of Binnig et al. Such a substitution would completely change the principle of operation of Binnig et al. and would only be attempted in hindsight in view of the Applicants' teachings.

In regard to claims 11 and 28, Azuma et al. was cited as teaching that the circuit comprises a plurality of electrically conductive traces which are formed in the cantilever and which comprise a source and a drain of the FET and wherein the source or drain of the FET forms part of a circuit which supplies electrical current to the write/read tip (citing fig. 1).

Since claims 11 and 28 depend from claims 10 and 27 respectively, this rejection is traversed for the reasons set forth above with respect to the traversal of the rejections of claims 10 and 27, and for the following reason. The Applicants respectfully submit that fig. 1 of Azuma et al. does not show a plurality of electrically conductive traces which are formed in the cantilever and which comprise a source and a drain of the FET which supplies electrical current to a heater. With respect to the Applicants' previous arguments, the Office Action states:

> "The examiner maintains this rejection because the examiner never states the tip of Azuma et al. is a heater. The examiner stated the FET of Azuma et al. is used to feed a current to the top [sic] of Azuma et al."

This statement completely misinterprets the Applicants' previous argument. The Applicants' claims 11 and 28 specify the use of a plurality of electrically conductive traces which are formed in the cantilever and which comprise a source and a drain of the FET which supplies electrical current to a heater. The cited references do not disclose or suggest the use of a plurality of electrically conductive traces which are

formed in the cantilever and which comprise a source and a drain of the FET which supplies electrical current to a heater.

In regard to claim 12, Azuma et al. was cited as teaching that the plurality of electrically conductive traces further comprise a channel interposed between the source and the drain of the FET (citing fig. 1 as showing a wire connecting the source and the drain, and asserting that there also must be a connection within the source and drain within the FET).

Since claim 12 depends from claim 11, this rejection is traversed for the reasons set forth above with respect to the traversal of the rejection of claim 11.

In regard to claim 13, Binnig et al. was cited as teaching that the cantilever is made of silicon and the electrically conductive traces are formed by doping the silicon to render selected regions electrically conductive (citing column 6, lines 56-59).

Since claim 13 depends from claim 11, this rejection is traversed for the reasons set forth above with respect to the traversal of the rejection of claim 11.

In regard to claims 15 and 44, Binnig et al. was cited as teaching that the cantilever has a pair of arms which are interconnected by a bridge member (citing fig. 5, element 45), wherein the probe is formed on the bridge member (citing fig. 5, element 47), and wherein the heater is formed on the bridge member and wherein the doped traces are formed on both arms (citing fig. 4b, element 39, and column 6, lines 56-59).

Since claim 15 depends from claim 14, the rejection of claim 15 is traversed for the reasons set forth above with respect to the traversal of the rejection of claim 14. In addition, since claim 44 depends from claim 43, the rejection of claim 44 is traversed for the reasons set forth below with respect to the traversal of the rejection of claim 43.

In regard to claim 16, Binnig et al. was cited as teaching feeding a heater element with a current (citing figs 4 and 5). Azuma et al. was cited as teaching feeding a probe with a current driven by a FET (citing fig. 1 elements 201-205).

Since claim 16 depends from claim 10, this rejection is traversed for the reasons set forth above with respect to the traversal of the rejection of claim 10, and for the following reasons. Claim 16 specifies that the FET functions as a heater. The

Applicants respectfully submit that the cited references do not disclose or suggest the use of an FET as a heater. More particularly, the FET of fig. 1 of Azuma et al. does not function as a heater.

In regard to claims 17 and 29, Azuma et al. was cited as teaching an induced channel FET (citing column 7, lines 19 and 20).

Since claims 17 and 29 depend from claims 10 and 27 respectively, this rejection is traversed for the reasons set forth above with respect to the traversal of the rejections of claims 10 and 27.

In regard to claim 18, Binnig et al. was cited as teaching that the medium is electrically non-conductive and is supported on a substrate which is electrically conductive (citing the claim 9 rejection), and that the substrate is configured to be circuited with the tip so that variations in the electrical field which result from a change in distance between the medium and the cantilever, induces a change in electrical current passing through the tip, and produces a read signal (citing the claim 1 rejection). The Office Action further refers to the claim 10 rejection.

Since claim 18 depends from claim 3, this rejection is traversed for the reasons set forth above with respect to the traversal of the rejection of claim 3, and for the following reasons. The Applicants respectfully submit that Binnig et al. does not disclose or suggest the use of a substrate that is configured to be circuited with an FET so that variations in the electrical field which result from a change in distance, *between the medium and the cantilever*, induces a change in electrical current passing through the FET, and produces a read signal.

In regard to claim 30, Azuma et al. was cited as teaching that the cantilever is formed of silicon and the tip comprises a doped portion which is electrically connected with doped regions that form a source and a drain of the FET (citing fig. 1, and column 6, lines 24-33).

Since claim 30 depends from claim 27, this rejection is traversed for the reasons set forth above with respect to the traversal of the rejection of claim 27, and for the following reasons. Claim 30 specifies that the *heater* comprises a doped portion. The

Applicants respectfully submit that Azuma et al. do not disclose or suggest a cantilever formed of silicon and wherein a *heater* comprises a doped portion.

In regard to claim 43, Azuma et al. was cited as teaching FET means formed in a silicon cantilever by doping electrically conductive source and drain regions in a selected surface of the cantilever (citing fig. 1, and column 6, lines 24-33), for being gated by an electric field which is generated by applying a bias to a substrate separate from the cantilever (citing fig. 15 element 45, and column 18, lines 1-7, and fig. 3 element 1010 and column 9, lines 36-38); and a probe on the selected surface of the cantilever (citing fig. 15 elements 11 and 12).

Binnig et al. was cited as teaching heater means in the cantilever proximate the probe for heating and forming a data bit indicative topography in a medium to be engaged by the probe (citing fig. 4, element 39) and wherein the electrical field changes with changes in distance between the substrate and cantilever (citing column 18, lines 59-67, and column 19, line 1).

This rejection is traversed. The Applicants respectfully submit that the invention defined in claim 43 includes features and combinations of features that are not shown or suggested by Azuma et al. In particular, claim 43 specifies that the electrical field changes with changes in distance *between the substrate and the cantilever.* While fig. 3 of Azuma et al. shows the application of a bias to a substrate, Azuma et al. does not disclose or suggest a FET that is gated by an electric field which changes with changes in distance between the substrate and the cantilever.

Claim 14 has been rejected under 35 U.S.C. 103(a) as being unpatentable over Binnig et al. in view of Azuma et al., further considered with Mamin et al. (US 5729026).

In regard to claim 14, Binnig et al. and Azuma et al. were cited as teaching all the elements of claim 14 except wherein the heater comprises a doped region having an electrical resistance which is higher than the traces.

Mamin et al. was cited as teaching that the heater comprises a doped region having an electrical resistance which is higher than the traces (citing fig. 1d, elements 123 and 125).

According to the Office Action, it would have been obvious to one of ordinary skill in the art to provide the apparatus of Binnig et al. with Azuma et al. and the doped heater of Mamin et al.

Since claim 14 depends from claim 11, this rejection is traversed for the reasons set forth above with respect to the traversal of the rejection of claim 11, and for the following reason. While Mamin et al. shows a heater including a doped region, the Applicants respectfully submit that there is no teaching or suggestion in the cited references that a source or drain region of an FET can serve as a heater as specified in claim 11.

All claims in the application are believed to be in allowable form. Allowance of the application is requested.

Respectfully submitted,

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